10/5/17
"It is the empty space within the vessel that makes it useful" -Tao Te Ching

HW: "Dividing Radicals" worksheet #3, 6, 9, 12, 15, 18, 21
Test 2 on Monday 10/16

AIM: How do we divide with radicals?

Warm Up:
Simplify the following

1) $8\sqrt{8} + 2\sqrt{24} - 2\sqrt{18}$

$\sqrt{4}\ \sqrt{2} \quad \sqrt{4}\ \sqrt{6} \quad \sqrt{9}\ \sqrt{2}$

$8 \cdot 2\sqrt{2} \quad 2 \cdot 2\sqrt{6} \quad 2 \cdot 3\sqrt{2}$

$16\sqrt{2} + 4\sqrt{6} - 6\sqrt{2}$

$10\sqrt{2} + 4\sqrt{6}$

42) $(48\sqrt{2})^2$

$48\sqrt{2} \cdot 48\sqrt{2}$

$2304\sqrt{4}$

$2304(2) = \boxed{4608 \text{ meters}^2}$

43) $\boxed{A = L \cdot W}$

$\sqrt{50}$

$12\sqrt{2}$

$12\sqrt{2} \cdot \sqrt{50}$

$12\sqrt{100}$

$12(10) \rightarrow \boxed{120 \text{ feet}^2}$

When **dividing** radicals, you must divide the numbers **OUTSIDE (O)** the radicals **AND** then divide the numbers **INSIDE (I)** the radicals.

EX) $$\frac{4\sqrt{15}}{2\sqrt{3}} = \frac{4}{2} \bullet \sqrt{\frac{15}{3}} = 2\sqrt{5}$$

3) $\sqrt{27a} \div \sqrt{3a^3}$

$$\frac{\sqrt{27a}}{\sqrt{3a^3}} = \sqrt{\frac{27a}{3a^3}} = \sqrt{\frac{9}{a^2}} = \frac{\sqrt{9}}{\sqrt{a^2}} = \boxed{\frac{3}{a}}$$

$$\frac{\cancel{a}}{\cancel{a} \cdot a \cdot a}$$

We dont want radicals in our denominator. We need to Rationalize.
(Get the radical out of the denominator)

4) $\dfrac{\sqrt{15}}{\sqrt{45}} = \dfrac{\sqrt{1}}{\sqrt{3}} = \dfrac{1}{\sqrt{3}} \cdot \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{\sqrt{3}}{3}$

$\sqrt{9}$

5) $\dfrac{12\sqrt{10a}+8\sqrt{15b}}{4\sqrt{5ab}} \cdot \dfrac{\sqrt{5ab}}{\sqrt{5ab}} = \dfrac{12\sqrt{50a^2b}+8\sqrt{75ab^2}}{4(5ab)}$

$\sqrt{25a^2b^2}$
$5ab$

$= \dfrac{12\sqrt{50a^2b}+8\sqrt{75ab^2}}{20ab}$

$12\sqrt{50a^2b}$
$\sqrt{25a^2} \quad \sqrt{2b}$
$12 \cdot 5a\sqrt{2b}$
$60a\sqrt{2b}$

$8\sqrt{75ab^2}$
$\sqrt{25b^2}\sqrt{3a}$
$8 \cdot 5b\sqrt{3a}$
$40b\sqrt{3a}$

$= \dfrac{\overset{3}{\cancel{60}}a\sqrt{2b}+\overset{2}{\cancel{40}}b\sqrt{3a}}{\underset{1}{\cancel{20}}ab}$

$\boxed{\dfrac{3a\sqrt{2b}+2b\sqrt{3a}}{ab}}$

1. Jonathan said that $\frac{\sqrt{10}}{2} = \sqrt{5}$. Do you agree with Jonathan? Justify your answer.
2. Show that the quotient of two irrational numbers can be either rational or irrational.

Developing Skills

In 3–29 write each quotient in simplest form. Variables in the radicand with an even index are non-negative. Variables occurring in the denominator of a fraction are non-zero.

3. $\sqrt{24} \div \sqrt{6}$	4. $\sqrt{75} \div \sqrt{3}$	5. $\sqrt{72} \div \sqrt{8}$
6. $\sqrt{50a^3} \div \sqrt{5a}$	7. $\sqrt{24x^2} \div \sqrt{3x^3}$	8. $\frac{\sqrt{150}}{\sqrt{3}}$
9. $\frac{\sqrt{54}}{\sqrt{2}}$	10. $\frac{\sqrt{300}}{\sqrt{25}}$	11. $\frac{\sqrt{35a^3}}{\sqrt{10a}}$
12. $\frac{\sqrt{80x^2y}}{\sqrt{30xy^2}}$	13. $\frac{\sqrt{27b}}{\sqrt{6b^2}}$	14. $\frac{3}{\sqrt{3x}}$
15. $\frac{7}{\sqrt{7y}}$	16. $\frac{\sqrt{12a^2}}{\sqrt{4a}}$	17. $\frac{\sqrt{18c^3}}{\sqrt{9c}}$
18. $\frac{4\sqrt{2} + 8\sqrt{12}}{2\sqrt{2}}$	19. $\frac{3\sqrt{10} - 9\sqrt{50}}{3\sqrt{5}}$	20. $\frac{\sqrt{72} + \sqrt{54}}{\sqrt{18}}$
21. $\frac{\sqrt{20} - \sqrt{5}}{\sqrt{5}}$	22. $\frac{\sqrt{48} + \sqrt{3}}{\sqrt{3}}$	23. $\frac{\sqrt{10} + \sqrt{15}}{\sqrt{10}}$
24. $\frac{5 + 6\sqrt{5}}{\sqrt{5}}$	25. $\frac{\sqrt[3]{27x^3} + \sqrt[3]{36x^5}}{\sqrt[3]{3x^3}}$	26. $\frac{\sqrt[4]{ab^4}}{\sqrt[4]{a^2b^4}}$
27. $\frac{\sqrt[4]{c^6}}{\sqrt[3]{c^3}}$	28. $\frac{\sqrt[3]{24w^2}}{\sqrt[3]{3w^4}}$	29. $\frac{\sqrt{64x^4} + \sqrt[4]{40x^6}}{\sqrt[4]{x^6}}$

3) $\frac{\sqrt{24}}{\sqrt{6}} = \sqrt{4} = \boxed{2}$

6) $\frac{\sqrt{50a^3}}{\sqrt{5a}} = \sqrt{10a^2}$

$\sqrt{a^2}\ \sqrt{10}$

$\boxed{a\sqrt{10}}$

9) $\frac{\sqrt{54}}{\sqrt{2}} = \sqrt{27}$

$\sqrt{9}\ \sqrt{3}$

$3\sqrt{3}$

$\sqrt{8x}$

$\sqrt{4}\ \sqrt{2x}$

$2\sqrt{2x}$

12) $\frac{\sqrt{80x^2y}}{\sqrt{30xy^2}} = \frac{\sqrt{8x}}{\sqrt{3y}} = \frac{2\sqrt{2x}}{\sqrt{3y}}$

$\frac{2\sqrt{2x}}{\sqrt{3y}} \cdot \frac{\sqrt{3y}}{\sqrt{3y}} = \boxed{\frac{2\sqrt{6xy}}{3y}}$

15) $\frac{7}{\sqrt{7y}} \cdot \frac{\sqrt{7y}}{\sqrt{7y}} = \frac{\cancel{7}\sqrt{7y}}{\cancel{7}y} = \frac{\sqrt{7y}}{y}$

$\sqrt{24}$

$\sqrt{4}\ \sqrt{6}$

$2\sqrt{6}$

18) $\frac{4\sqrt{2} + 8\sqrt{12}}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{4\sqrt{4} + 8\sqrt{24}}{2\sqrt{4}}$

$\frac{\overset{2}{\cancel{8}} + \overset{4}{\cancel{16}}\sqrt{6}}{\underset{1}{\cancel{4}}} \longleftarrow \frac{4(2) + 8 \cdot 2\sqrt{6}}{2 \cdot 2}$

$\boxed{2 + 4\sqrt{6}}$

$\sqrt{20}$

$\sqrt{4}\ \sqrt{5}$

$2\sqrt{5}$

21) $\frac{\sqrt{20} - \sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{5} - \sqrt{5}}{\sqrt{5}} = \frac{1\sqrt{5}}{\sqrt{5}}$

$= \boxed{1}$

21) Alternate:

$\frac{1}{2} + \frac{3}{2} = \frac{1+3}{2}$

$\frac{\sqrt{20} - \sqrt{5}}{\sqrt{5}}$

$\frac{\sqrt{20}}{\sqrt{5}} - \frac{\sqrt{5}}{\sqrt{5}}$

$\sqrt{4} - 1$

$2 - 1 = \boxed{1}$

7) $\dfrac{\sqrt{24x^2}}{\sqrt{3x^3}} = \dfrac{2x\sqrt{6}}{\sqrt{3x^3}} = \dfrac{2x\sqrt{6}}{x\sqrt{3x}} \cdot \dfrac{\sqrt{3x}}{\sqrt{3x}} = \dfrac{2x\sqrt{18x}}{x \cdot 3x}$

$\sqrt{24x^2} \to \sqrt{4x^2}\ \sqrt{6} \to 2x\sqrt{6}$

$\sqrt{3x^3} \to \sqrt{x^2}\ \sqrt{3x} \to x\sqrt{3x}$

$\sqrt{18x} \to \sqrt{9}\ \sqrt{2x} \to 3\sqrt{2x}$

$\dfrac{2x\sqrt{18x}}{3x^2} = \dfrac{2\cancel{x} \cdot \cancel{3}\sqrt{2x}}{\cancel{3}\cancel{x^2}} \quad x$

$\dfrac{2\sqrt{2x}}{x}$

$\dfrac{\sqrt{24x^2}}{\sqrt{3x^3}} = \dfrac{\sqrt{8}}{\sqrt{x}} \cdot \dfrac{\sqrt{x}}{\sqrt{x}} = \dfrac{\sqrt{8x}}{x} = \dfrac{2\sqrt{2x}}{x}$

(*) Simplify Radicals:

- No perfect factors
- No fractions under radical
- No radical in the denominator of a fraction.

HW: 10, 13, 16, 19